Forward Fit Graphical User Interface

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1. General

All of the modules needed for the Forward Fit GUI can be downloaded from http://hesperia.gsfc.nasa.gov/∼pernak/software/my_software/Forward_Fit/gui/. Individual functions are present, but everything required is in the .tgz file. Once downloaded and unzipped, the forward fitting GUI can be accessed by typing 'ff_gui' at the IDL command line. No input is needed. Before fitting an event, visibilities will need to be constructed.

2. Making Visibilities

There are two ways to make visibilities: 1) by filling in the text boxes and choosing the detectors and clicking on "Make/Restore Visibilities," so that visibilities are actually constructed, or 2) by selecting a visibility FITS file, choosing the detectors and clicking on "Make/Restore Visibilities," so that previous visibilities are restored and edited for the detectors chosen. In the case of 1), the "Visibility FITS File" text field should be blank, or else the GUI will search in the working directory for whatever's typed in the widget.

3. Fitting

Once visibilities are calculated or restored, the user can use Gordon Hurford's Forward Fitting program. First, though, a gaussian shape and number of sources will need to be picked. For now, the GUI only works for up to three sources.

1. *Circular Gaussians*
   Contain four fitting parameters for each source: srcx (arcsec), srcy (arcsec), flux (photons/cm^2/s), and fwhm (arcsec).

2. *Elliptical Gaussians*
   Contain six fitting parameters for each source – all the circular gaussian parameters plus eccentricity (between 0.0 and .9) and position angle (degrees relative to N-S axis). Only 1 elliptical gaussian can be fitted.

3. *Loop Gaussians*
   All of the elliptical gaussian parameter plus loop angle (degrees). Only one loop can exist in an event (number of sources = 1).

Fitting is done by clicking on "Forward Fit." A new window will pop up for inputting the user's initial guesses of source parameters. After the guesses are in the text fields, the user can click on "Fit Data" in the initial guesses window and hsi_vis_fwdfit will be executed.

Clicking on "Done" in the initial guesses window destroys the window and returns the user to the main GUI window. Once the user clicks on "Done" again, they will be returned to their IDL session.

3.1. MEM_NJIT Map

Initial guesses should be made based on images from other visibility-based algorithms. In the case of RHESSI, maps should be made with MEM_NJIT first, which can be done by clicking on the "MEM_NJIT Map" button in the "Initial Guesses for Forward Fitting" window. A map will be made based using the visibilities already constructed and the output is sent to plotman. In the plotman window, the user can use the "Image Flux" tool to determine the flux and centroids of the sources. FWHM has to be "eyeballed" using 50% contours.

4. Outputs

IDL windows of the visibility amplitude profile fit and Plot Manager with the Forward Fit map are default graphical outputs of Gordon Hurford's code. A PostScript file is also created (of the form chisq_profilesYYYY–MM–YY_E??-??.ps) and appears on the screen – it represents the χ^2 profiles of the fitted parameters. χ^2 cross sections are calculated by a program created by Ed Schmahl. Unedited visibilities are saved in the user's working directory, and the file name is of the form mmmyyyy_dd_tttttt–ttttttE??-??.fits.

Forward Fit parameters are also saved – the file has the same format as the visibility FITS file, only with a "_ff.sav" at the end instead of ".fits". The file contains the fitted

parameters (visfit), the uncertainties in the parameters (sigma), and the input (guesses) parameters (srcparm). The latter conveniently can be used in later sessions – one can "Restore Initial Guesses" in the initial guesses window should the user have to go back and investigate a previously analyzed flare.